SS-AAEA Journal of Agricultural Economics *2008 Articles*

The Profitability of Preconditioning Calves in Oklahoma Over 10 Years.

Myriah Johnson

Abstract

Cow-calf operators continually look for more profitable ways to market their cattle. Some producers precondition their weaned calves, but many still wonder if this practice is profitable. A large amount of research has been done on this topic, but results can vary according to the geographic region. The objective of this study is to determine whether or not it was profitable to precondition weaning calves in Oklahoma for the 1997-2006 time period. Bulk ingredient prices for a feed ration, Oklahoma market prices, and other data were gathered to evaluate the revenues and expenses for preconditioning in Oklahoma during 1997-2006. Findings showed it was profitable to precondition calves in Oklahoma in nine out of the ten years studied.

Myriah Johnson is a senior in the Department of Agricultural Economics at Oklahoma State University, and her advisor is F. Bailey Norwood from the same department. They can be reached at myriah.johnson@okstate.edu and bailey.norwood@gmail.com, respectively.

The Profitability of Preconditioning Calves in Oklahoma Over 10 Years.

1. Introduction

Millions of head of cattle are raised each year in the United States. Hoping to gain an economic advantage, cattle producers evaluate various examine marketing alternatives available to them. Preconditioning is a marketing alternative where, instead of selling the calf when it is weaned, the producer keeps the calf for one to two months after weaning. During this post-wean phase, the cow-calf producer helps calves overcome the stress of weaning and boosts their health through a number of farm activities.

Preconditioning has been considered a marketing alternative for about 50 years. In the beginning, the major question was whether preconditioning was beneficial for calves. Animal scientists proved that preconditioning had health benefits for calves. Besides being beneficial to the calf, producers also want to know if preconditioning is profitable. Profitability depends on a number of factors and differs from region to region across the United States. Therefore, just because one study says it is profitable in the mid-West does not mean it is profitable in the Southern plains region. Kevin Dhuyvetter, of Kansas State University, has done a great deal of research on preconditioning to assess its profitability. Dr. Dhuyvetter has specifically sought to identify the cost of many preconditioning activities, such as health supplies and medicine/head, shrink, and labor and equipment/head. Many of the assumptions in this model come from his research. Building on Dhuyvetter's research for the Kansas area this research uses a partial-budget model to determine if preconditioning was profitable in Oklahoma during the 1997-2006 time period.

2. Background on Cow-Calf Production and Preconditioning

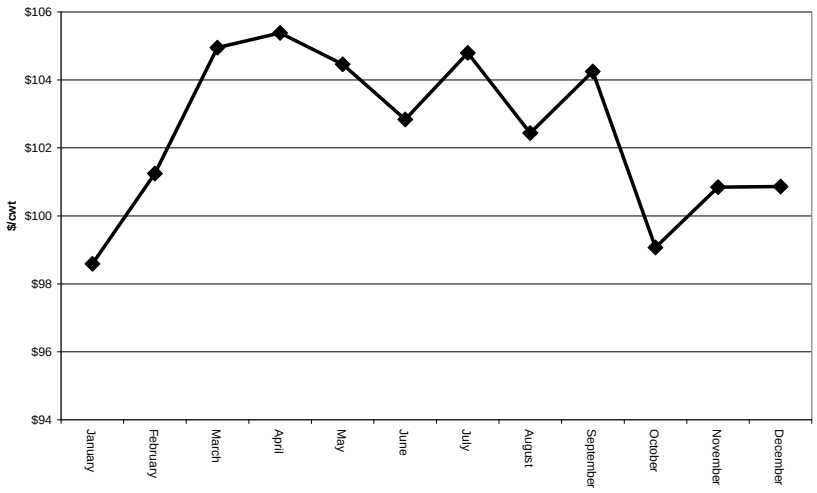
The production of beef occurs through numerous stages, where the live animal and the beef product may change ownership multiple times before the product is consumed. A general and succinct description of these stages are (1) cow-calf production, where cattle are bred, calves are born, and calves are raised until they are weaned (2) stocker production, where weaned calves are placed on pasture until they are around 700 lbs (3) fed-cattle production, occurring in a feedlot, where cattle are fed a high protein diet (e.g. corn and soybean meal) (4) cattle slaughter and processing, after which (5) the beef product is sold to wholesalers and retailers who offer the product for sale to the consumer. Each stage is typically, but not necessarily, owned and operated by a different firm.

Of these five stages, the cow-calf stage is most closely tied to seasons. On most cow/calf operations throughout the United States, calves are born in late winter or early spring. The calf grows alongside its mother for the next seven to eight months. During this time the calf nurses from its mother, but as it matures it also learns to eat the grass in the pasture, in addition to other supplements that the owner may provide. Cow-calf producers time the calves' birthing so

that the period of greatest need for forage coincides with summer, the season with the greatest amount of forage. At the end of these months the calf will be ready to be separated, or weaned, from its mother. This generally occurs in beginning to mid-October. The calf, generally weighing in the range of 500-600 pounds, after which it enters the stocker stage of production. It should be noted that the stocker stage can, and sometimes is, skipped, and the weaned calf goes directly to the feedlot.

This is only a general description and does not describe the strategies of all cow-calf producers. Most producers make their breeding decisions such that calves are weaned in October, which means the supply of weaned calves is greatest in October. Thus, the price of weaned calves is lowest in October, as shown in Figure 1. Some producers manage their breeding so that calves are born in August and weaned in March. Since few producers pursue this strategy, the supply of weaned calves in March is low, which provides these producers with a higher market price. Of course, an operation that calves in August experiences higher costs than one that calves in February-March, so the premium does not necessarily imply higher profits (Norwood and Lusk, 2007).

Figure 1. Seasonality of Weaned Calf Prices



Notes: Data are taken from the Livestock Marketing Information Center. The prices are the average price of steers weighing 500-600 lbs for the period 1997-2006.

Producers who wean calves in October do not have to sell those calves at weaning. An alternative option is to enter the calves into a preconditioning program. Weaning is a stressful period for the calf, and that stress makes them more susceptible to disease. Sending a freshly-

weaned calf directly to a sale barn will almost certainly result in some degree of sickness. A preconditioning program (also known as backgrounding) entails postponing the sale and transport of weaved calves until the stress of weaning has passed. That is, instead of selling the calf immediately after weaning, they are cared for on the cow-calf farm for a period of time, after which they are sold.

The preconditioning programs are variable lasting approximately 30, 45, or 60 days. Those calves that are certified are known as VAC-30, 45, and 60, respectively, programs, with VAC standing for vaccinated and certified. Those that are VAC certified have to pass through certain protocols, administering different vaccinations, and being certified by a third party. Those that have no certification are referred to by the number of days the calves remain in the program. The programs provide special care for the calves to help them recover from the stress of weaning, such as feeding them nutritious meal.

Additionally, a number of management activities are intended to increase the value of the calf. These include vaccinations, castration and dehorning. Thus, when the calf is sold, the calf is healthier, less likely to acquire sickness, heavier, and simply more valuable. There is no doubt that preconditioning cattle adds a benefit to the calves health, resulting in lower morbidity and mortality rates, lowering medical costs, increasing worth to feeder cattle buyers (Avent, Ward, and Lalman, 2004). Preconditioning calves allows their immune systems to become stronger and makes them better equipped to cope with stress, which is an important factor when calves are shipped to market. During transit and at market, they will be placed under stress, standing for several hours without feed or water. These conditions break down the immune system of the calf, allowing for susceptibility to sickness. This in turn can result in the calves being discounted when they go through the sale ring.

A higher average daily gain is also possible for preconditioned calves once they enter the stocker or feedlot stage. A higher average daily gain relates to a lower cost of gain. Compared to non-preconditioned calves, those that are preconditioned experience less shrink when transported from the farm to the sale barn (Dhuyvetter, Bryant, and Blasi, 2005). All of these activities add value to the calf in the feedlot stages and beyond, which allows the calf to command higher premiums. Of course, the buyer may want some sort of verification of the aforementioned activities, such as vaccinations, and third party certifications. Certification adds costs, but can result in higher premiums as well (Bulut and Lawrence, 2006).

Preconditioning has advantages and disadvantages. All preconditioning activities increase costs. Costs will probably fall in between $35-$60 per head for a 45-day program (Dhuyvetter, 2005). Items such as extra feed and vaccination are obvious costs. Other perhaps non-obvious costs are the extra fences and pens to hold weaned calves who are anxious to return to their mothers, additional equipment such as feeding troughs, the opportunity cost of time for management, and even the opportunity cost of forgone interest.

Additional revenues from preconditioning can offset these costs. First, because the calves are growing during the preconditioning period, the producer has more pounds of calves to sell. Second, recall that calf prices are lowest in October, when most calves are weaned. By delaying sale until November-January the producer can benefit from the rise in market prices, as shown in Figure 1 above. Third, buyers will pay a higher per pound price for preconditioned calves because they are healthier and less likely to succumb to sickness. The purpose of this paper is to measure these benefits and costs to Oklahoma cow-calf producers to better determine the desirability of preconditioning in Oklahoma.

3. Research Objectives

The previous section illustrates the advantages and disadvantages of preconditioning as a marketing program for cow-calf producers. The objective of this project is to measure the profitability of preconditioning calves, assuming market conditions resembling the time period 1996-2006 in Oklahoma. The specific preconditioning program considered is a 45-day, non-certified program. To achieve these objectives, this paper proceeds as follows. The next section describes the methodology used in this research, which includes a discussion of the partial-budget model constructed in a spreadsheet, biological assumptions, and market price assumptions. The fifth section articulates the results of this model, and the final section discusses the implications of this study for Oklahoma cow-calf producers.

4. Research Methodology and Data

To assess the profitability of a 45-day preconditioning program in Oklahoma, a spreadsheet model is constructed comparing the additional costs and revenues of preconditioning. The model assumptions are designed to mimic market conditions in Oklahoma during the 1996-2006 time period. First, the general methodology used to construct the model is described. Then, a specific methodology is provided that lists the exact biological and price assumptions used.

Recall that the general objective of this project is to assess the profitability of a 45-day preconditioning (or backgrounding) program for calves in Oklahoma, using market conditions from the time period 1996-2006. The baseline program is a setting where calves are sold immediately after weaning in October. Preconditioning is the alternative program where the calves are still weaned in October, but are cared for on the farm for 45 days, receiving additional feed and health care before being sold in December. Preconditioning entails additional costs and revenues, and the spreadsheet model developed here employs a partial budgeting procedure to measure the net change in profits from backgrounding. Profits from producing weaned calves equal price times quantity minus costs, as shown in (1).

(1) $\text{Profits}_B = (\text{Price}_B)(\text{Quantity}_B) - \text{Costs}_B$

The "B" subscript in (1) denotes the baseline program described above. Letting "P" denote preconditioning, profits under a preconditioning program can be written as follows.

(2) $\text{Profits}_P = (\text{Price}_P)(\text{Quantity}_P) - \text{Costs}_P$

The change in profits from moving from the baseline to the preconditioning program is then (2) minus (1), or

(3) $\text{Change in Profits} = [(\text{Price}_P)(\text{Quantity}_P) - (\text{Price}_B)(\text{Quantity}_B)] - [\text{Costs}_P - \text{Costs}_B]$

The first term in brackets is the change in revenue while the second term is the change in costs. If the revenue change is greater than the cost change, preconditioning results in higher profits. Below, the data and assumptions used to measure the change in revenue are detailed, and are followed by a similar section for costs. Then, the revenues and costs are combined to provide an overall assessment of the profitability of preconditioning.

These revenues and costs are calculated for each year during the 1997-2006 period to depict how profitability varies over time. The annual preconditioning profits can then be average over this year as a final indicator of preconditioning profitability.

4.a. Change in Costs

Recall that a preconditioning program entails feeding and caring for calves an additional 45 days, as well as providing the calf with a host of treatments to boost its health. The additional activities associated with preconditioning are: opportunity cost of money,[1] health supplies and medicine, death loss per head, labor and equipment, feed, hay, and pasture per head, along with the marginal difference of marketing costs between October and December in that 45-day period.

The cost of additional health supplies and medicine are assumed to be $8.00/head (Dyuyvetter, 2004). Holding calves for longer periods before sale, as conducted in a preconditioning program, increases the chance of one of more of those calves dying, which results in a loss of revenues. Dhuyvetter (2004) estimates the mortality rate of weaned calves in a preconditioning program to be approximately 0.25%. By multiplying the per head revenues of calves sold in October (the revenues received if preconditioning was not used) by the 0.25% mortality rate, we account for loss of revenues due to mortality. The Dhuyvetter (2004) study also provides estimates of additional labor and equipment and marketing costs from preconditioning. That labor and equipment cost is $4.50 per head, and the additional marketing cost is $3.00 per head (Dhuyvetter, 2004).

To help calves overcome the stress of weaning, boost health, and add weight, the preconditioning program considered here assumes calves have access to pasture, hay, and additional feed consisting of a soybean hull, cottonseed hull, wheat middlings, corn, cottonseed meal, and soybean meal. The feed formulation (e.g. lbs of soybean meal in each ton of feed) is

[1] By waiting to sell calves, the producer foregoes the opportunity to sell the calves now and earn interest on the proceeds.

taken from a custom preconditioning feed made in Stillwater, Oklahoma (Gill, 2007). Then, input prices for each feed ingredient were collected from various sources for each year of the 1997-2006. Multiplying the input prices for each year by the estimated consumption of each ingredient for each calf over the preconditioning period yields the total feed cost for each year.

To illustrate, the following describes how feed costs are calculated for the year 2000. By multiplying the input price by the amount of ingredient in each ton of feed ration, the per-ton cost of feed is estimated to be $130 per ton. Nutritionists estimate that each calf will consume 4.4 lbs of feed per day (Wells, 2007), which multiplied over a 45-day preconditioning program, multiplied by the $130 per ton feed cost, and divided by 2,000 lbs, produces a feed cost of $12.87 per head. Similarly, assuming each calf consumes 10.33 lbs of hay per day at a cost of $75 per ton, the hay cost is estimated to be $17.43 over the 45-day program. Pasture costs are assumed unchanged, as cow-calf operators tend to maintain the same acreage regardless of whether preconditioning is used, and conventional grasses are dormant during the preconditioning period.

Therefore, the additional feed costs from preconditioning are the sum of feed and hay costs, which amount to $30.29 per head over the entire 45-day program for the year 2000. This same procedure is applied to all other years to determine how feed costs vary over time. The only cost variables that change over time are feed ingredient costs, not the consumption of feed by the animals.

Also taken into account in this model is the opportunity cost of raising the calf for the extra 45-day period. The opportunity cost of keeping the calf for an additional 45 days involves how the money spent on health supplies, labor and equipment, and feed could have been used differently, for instance, invested in an interest-earning instrument. To calculate this opportunity cost, the cost of health supplies and medicine, labor and equipment, and feed per head are summed. This sum is multiplied by 0.5 to account for the fact that supplies are not purchased at the beginning of the preconditioning program, but are spread uniformly throughout the program. Then, the revenue that would have been received from marketing the calves at weaning is added to the aforementioned sum. Together, these two numbers represent the money that could have been invested in a risk-free financial instrument over the 45-day program, had the preconditioning program were not employed.

These cash outlays and foregone revenues are multiplied by an interest rate of 8% (as is typical in enterprise budgets), and multiplied by (45/365.25) to convert the 8% annual interest rate to a 45-day interest rate. The resulting number constitutes the opportunity cost of money, which is added to the expenses mentioned above for a final preconditioning cost estimate. Below, Table 1 shows the contribution of each expense category on overall preconditioning costs. The expenses for each expense category are averaged across the 1997-2006 period and are reported below. On average, the preconditioning program raises costs by $49.94 per head for steers.

Table 1. Expense Categories for 45-Day Preconditioning Program (Steer, 1997-2006)

	Cost Per Steer
Interest (cattle, feed, supplies) @ 8%	$5.53
Health supplies and medicine	$8.00
Death Loss, $/head (assumed 0.25% mortality rate)	$1.35
Labor and equipment	$4.50
Feed, hay, and pasture, $/head	$27.56
Marginal Marketing Costs	$3.00
Total Cost	**$49.94**

The actual preconditioning costs in any one year may be lower or higher than $49.94, mainly due to fluctuating feed costs. Costs differ for steers and heifers also. Table 2 below shows how these costs fluctuate across the 1997-2006 time period. As the table shows, costs were lowest in 1998-1999, but have recently risen to high levels due to high corn, soybean, and other feed prices.

Table 2. Annual 45-Day Preconditioning Per Head Costs by Calf Gender (1997-2006)

Year	Steer	Heifer
1997	$51.55	$50.68
1998	$46.88	$46.39
1999	$43.99	$43.37
2000	$47.86	$47.72
2001	$49.85	$49.17
2002	$49.43	$48.87
2003	$49.43	$48.92
2004	$48.40	$47.70
2005	$50.12	$49.55
2006	$61.92	$61.21

4.b. Additional Revenues

During the 45-day preconditioning period, value is added to the calf in terms of greater weight and higher quality from better health. The partial budget used in this paper assumes calves are preconditioned for 45 days with a daily weight gain of 1.33 lbs. (Dhyuvetter, 2004), leading to a total weight gain of 59.85 lbs. This weight gain is added to the beginning weight when the preconditioning period begins for a final weight of 609.85 lbs. When the cattle are transported to market for sale they undergo stress from traveling in the trailer, standing for long hours, and lack of water and food during the trip. The weight loss associated with transport is referred to as shrinkage. The shrinkage assumption used in this budget is 2.5% (Dhuyvetter, 2004), meaning that a calf weighing 609.85 lbs will only weigh 609.86(1-0.025) = 594.61 at the point of sale.

The sale weight is multiplied by the sale price to obtain the revenue. Preconditioned calves can be sold through private contract or auctions designed to specifically market preconditioned calves. Such calves should receive a premium over calves sold at generic stockyards. Thus, the price used in this budget equals a fixed premium over the Oklahoma weaned-calf market price.

The Oklahoma weaned-calf price is assumed equal to the price realized at the Oklahoma National Stockyards (ONSY) of Oklahoma City, Oklahoma. Price data at this location for the 1997-2006 period were retrieved from the Livestock Marketing Information Center databases. These price data denote average prices for a 300-400 pound calf, a 400-500 pound calf, and similar, up to 800 pounds. We assume that calves in the 300-400 lb price range actually weigh 350 lbs, and similar assumptions are made for the other weight categories. Then, regression analysis is used to relate the sale prices in Oklahoma City on any given date to the weight of the weaned calves. Specifically, the following regression model is used.

(4) $\textit{Sale Price} = a_0 + a_1(\textit{weight}) + a_2(\textit{weight})^2$

The market price of a 594.60 lb calf on any given date is calculated from the regression as $a_0 + a_1(594.60) + a_2(594.60)^2$, where the regression estimates of each a_i is calculated using data from the specific date the calf is assumed to be sold. Preconditioned calves are assumed to be sold on the first Monday in December. Preconditioning not only adds weight to the calf, but value for each pound in that the animal has undergone a health-improving program. This premium depends on whether the preconditioning program is certified by a third party. The calves in this model are not assumed certified by a third-party, bringing a lower premium compared to those that are third-party certified. Following Dhuyvetter (2004), a $4.00 premium per hundred-weight is added to the market price the first Monday of each year, calculated from the aforementioned regression. Once this final sale price per hundred-weight is found it is multiplied by the sale weight to reach the revenue for selling a preconditioned calf.

Revenues across years are given in Table 3 above. Preconditioning revenues exhibit greater variability than costs, with the difference between the largest and smallest revenues for

steers equaling $97.79 per head. In contrast, the difference between the largest and smallest costs is $17.93. Thus, the risk inherent in preconditioning is mostly due to fluctuating revenues. However, this fact does not imply that preconditioning is riskier than selling calves at weaning. On average, as Table 4 below shows, preconditioning increases revenues by $101.62, at least for the time period considered.

Table 3. Annual 45-Day Preconditioning Program Per Head Revenues by Calf Gender (1997-2006)

Year	Steer Revenue	Heifer Revenue
1997	$54.67	$61.46
1998	$84.28	$74.62
1999	$132.21	$114.01
2000	$101.62	$94.28
2001	$81.94	$72.65
2002	$71.96	$73.59
2003	$117.08	$101.23
2004	$66.07	$51.71
2005	$114.15	$75.33
2006	$34.42	$35.36

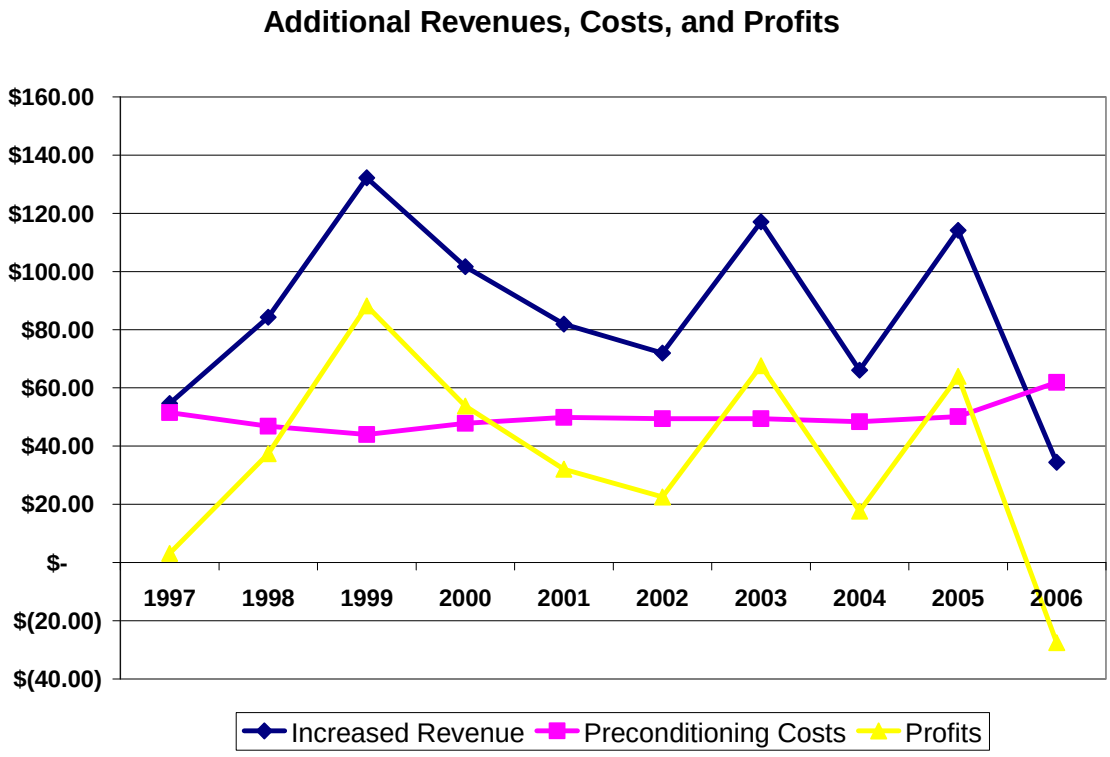
Table 4. Revenues Realized From Implementing a 45-Day Preconditioning Program (1997-2006)

Revenue Category	Revenue Per Head
Revenues Without Preconditioning	$ 501.04
Revenues With Preconditioning	$ 602.67
Increased Revenue From Preconditioning	$ 101.62

5. Results of Partial Budget Model

Figure 2 plots revenues, costs, and profits from implementing a preconditioning program over the 1997-2006 time period. Over these 10 years preconditioning was profitable in nine. Preconditioning costs remained fairly stable over the 10 years until it increased in 2006. Preconditioning profits exhibit more variability than costs, due to fluctuating revenues, although it only became unprofitable in one year. When normal market conditions are

observed, preconditioning is profitable. Thus, preconditioning is more often than not profitable.



Overall, the average net return from preconditioning is $35.90 for steers and $26.12 for heifers. This number can impact total revenues greatly. When many calves are preconditioned this number will multiply, increasing revenues. With careful management these revenues can continue to be achieved.

It should be taken into consideration though that 2006 was not profitable for preconditioning. Different factors that made this occur. In 2006 a drought occurred in much of the southern plains, causing a shortage of hay. This price change greatly affected the expense bill for preconditioning. In addition, cattle prices fell between October and December instead of rising as they generally do. Expenses were increased and revenues were decreased, in an amount large enough that preconditioning became unprofitable. Cattle producers should watch for some of these signs as an indication of when preconditioning is not profitable. Yet, overall, preconditioning can greatly enhance the income of an operation and should be considered when raising and marketing calves.

Summary and Conclusions

Preconditioning is one alternative for cow/calf producers in Oklahoma to enhance their profits. The additional revenue received from preconditioning can greatly impact the farm's returns. A small chance that those who precondition their calves will not receive a premium from it is possible, as seen above when nine out of the 10 years were profitable. Monitoring feed costs and cattle prices, in conjuction with the model in this paper, can help producers forecast years in which preconditioning might become unprofitable – such as the year 2006.

In addition, those who choose to have their calves third-party certified can receive higher premiums in addition to those received by non-third-party certified preconditioned calves, yet certification has added costs as well. Even for a small producer who will only market 35 calves, preconditioning can easily bring in a thousand more dollars in profit. Cow/calf producers should strongly consider preconditioning as an alternative to traditionally marketing weaned calves if they have not done so already.

References

Avent, R. K., Ward, C. E., & Lalman, D. L. 2004. Market Valuation of Preconditioning Feeder Calves. *Journal of Agricultural and Applied Economics*, 36(1), 173-183.

Bulut, H., & Lawrence, J. D. (2006). The Value of Third-Party Certification of Preconditioning Claims at Iowa Feeder Cattle Auctions. Iowa State University Working Paper #06031.

Dhuyvetter, K. 2004. "Economics of Preconditioning Calves." Paper presented at 2004 Kansas State University Agricultural Lenders Conference, Manhattan KS, 29 October.

Dhuyvetter, K.C., Bryant, A. M., & Blasi, D. A. (2005). Case Study: Preconditioning Beef Calves: Are Expected Premiums Sufficient to Justify the Practice? *The Professional Animal Scientist*, 21, 502-514.

Norwood, F., and J. Lusk. 2007. *Agricultural Marketing and Price Analysis*, 1st. ed. New Jersey: Pearson Prentice Hall

Wells, Robert. Noble Foundation. Feed consumption estimation. 2007

Gill, Pam. Stillwater Milling Company of Stillwater, OK. Feed ration mix for preconditioned calves. Personal Communication. July, 2007

Livestock Marketing Information Center. Accessed in July, 2007. Available at www.lmic.info.